CBSE Class 12 Physics Compartment 2026

Question Paper PDF

Conducted by Central Board of Secondary Education (CBSE)

General Instructions

(i) This question paper contains **33 questions**. **All questions are compulsory.**

(ii) This question paper is divided into five sections – **Section A, B, C, D and E**.

(iii) **Section A** – questions number **1 to 16** are multiple choice type questions. Each question carries **1 mark**.

(iv) **Section B** – questions number **17 to 21** are very short answer type questions. Each question carries **2 marks**.

(v) **Section C** – questions number **22 to 28** are short answer type questions. Each question carries **3 marks**.

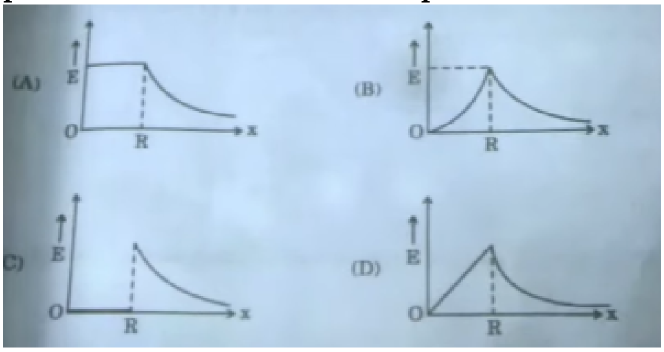
(vi) **Section D** – questions number **29 and 30** are case-based questions. Each question carries **4 marks**.

(vii) **Section E** – questions number **31 to 33** are long answer type questions. Each question carries **5 marks**.

1. Assume that the surface charge density of the Earth is 1 electron charge/m^2. The potential of the Earth's surface (radius 6400 km) will be :

(A) -0.12 V
(B) 0.21 V
(C) +2.1 V
(D) +1.2 V

2. A conducting sphere of radius R has a charge Q on it. Which of the following graphs correctly represents the value of electric field E in the range $0 \leq x < \infty$, where x is the distance of the point from the centre of the sphere ?



(A) Graph showing E constant then linearly decreasing

(B) Graph showing E = 0 up to R, then decreasing as $1/x^2$

(C) Graph showing E linearly increasing up to R, then decreasing

(D) Graph showing E sharply increasing and decreasing linearly

---

3. Two infinitely long straight conductors lie along x-axis and y-axis in the plane of the page. If they carry current I each along +x-axis and +y-axis respectively, the net magnetic field at a point with position vector $\vec{r} = (3\hat{i} + 4\hat{j})$ m will be :

(A) $\frac{\mu_0 I}{6\pi}\hat{k}$

(B) $-\frac{\mu_0 I}{12\pi}\hat{k}$

(C) $-\frac{\mu_0 I}{24\pi}\hat{k}$

(D) $\frac{\mu_0 I}{48\pi}\hat{k}$

---

4. In an electromagnetic wave, the electric field ($\vec{E}$) and the magnetic field ($\vec{B}$) oscillate along x-axis and y-axis respectively. The wave is propagating along :

(A) z-axis

(B) - z-axis

(C) x-axis

(D) - y-axis

5. Which of the following is also referred to as 'heat waves' ?

(A) Gamma rays

(B) X-rays

(C) UV rays

(D) Infrared rays

---

6. In a series LCR circuit connected to an ac source of voltage V and frequency ω, the power loss at resonance is :

(A) $I^2\omega L$

(B) $V^2/(\omega C)$

(C) V^2/R

(D) $V^2/(\omega L - \frac{1}{\omega C})$

---

7. If ν_X, ν_G and ν_U are frequencies of X-rays, Gamma-rays and UV rays respectively, then :

(A) $\nu_X > \nu_G > \nu_U$

(B) $\nu_G > \nu_X > \nu_U$

(C) $\nu_U > \nu_X > \nu_G$

(D) $\nu_X > \nu_U > \nu_G$

---

8. The energy of an electron in an orbit in a hydrogen atom (Bohr model) is -3.4 eV. Its angular momentum in this orbit is :

(A) $\frac{h}{\pi}$

(B) $\frac{h}{2\pi}$

(C) $\frac{h}{4\pi}$

(D) $\frac{2h}{\pi}$

---

9. A ray of light is incident at an angle of 60° on face AB of prism ABC with $\angle A = 30^\circ$. The ray emerging out of the prism makes an angle of 30° with the incident ray. The angle of emergence ($\angle e$) is equal to :

(A) 0°

(B) 30°

(C) 60°

(D) 90°

---

10. A point source in air is placed in front of convex spherical glass surface (n = 1.5 and R = 10 cm). Its real image is formed at the same distance as the surface from the source. The distance of the source from the surface is :

(A) 25 cm

(B) 50 cm

(C) 75 cm

(D) 100 cm

---

11. In forward and reverse biased silicon p-n junction, the dominant mechanisms for the motion of charge carriers are :

(A) diffusion in forward bias, drift in reverse bias

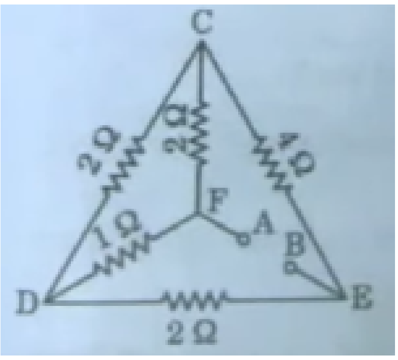
(B) drift in both forward bias and in reverse bias

(C) drift in forward and diffusion in reverse bias

(D) diffusion in both forward and reverse bias

---

12. Five resistors are joined as shown in the figure. Between the points A and B, a battery of 6 V is connected. How much current is flowing in arm FC ?



(A) 2.0 A

(B) 1.5 A

(C) 1.0 A

(D) 0.5 A

---

13. Assertion (A) : If $\vec{B}$ be the magnetic field at a small patch of vector area $\vec{dS}$, then the magnetic flux through the patch will be $\vec{B} \cdot \vec{dS}$.
Reason (R) : The magnetic flux is a scalar quantity.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(C) Assertion (A) is true but Reason (R) is false

(D) Assertion (A) is false but Reason (R) is true

---

14. Assertion (A) : The ratio of the speeds of the electron in the second to that in the third orbit in Bohr's hydrogen atom is 3/2.
Reason (R) : The speed of the electron in n^{th} permitted orbit in hydrogen atom varies proportional to $1/n$ i.e. $v_n \propto 1/n$.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion

(A)

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(C) Assertion (A) is true but Reason (R) is false

(D) Assertion (A) is false but Reason (R) is true

---

15. Assertion (A) : A free neutron is not a stable particle.

Reason (R) : It decays into a proton and an electron.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(C) Assertion (A) is true but Reason (R) is false

(D) Assertion (A) is false but Reason (R) is true

---

16. Assertion (A) : Electron emission from surface of zinc occurs when yellow light is incident on it.

Reason (R) : Energy of a photon of yellow light is more than the work function of zinc.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(C) Assertion (A) is true but Reason (R) is false

(D) Both Assertion (A) and Reason (R) are false

---

17. Calculate the kinetic energy of an electron which has the de Broglie wavelength of 600 nm associated with it.

18(a)(i). A monochromatic beam of light is travelling from a rarer to a denser medium. Giving reasons, explain the following: Is the frequency of the reflected and the refracted light the same as the frequency of incident light?

18(a)(ii). A monochromatic beam of light is travelling from a rarer to a denser medium. Giving reasons, explain the following: Does the decrease in speed in denser medium imply a reduction in the energy carried by the light wave?

OR

18(b)(i). The lower half of a concave mirror's reflecting surface is covered with an opaque non-reflecting material. What effect will this have on the image of an object placed in front of the mirror? Give reasons for your answer.

18(b)(ii). A lens made of glass of refractive index 1.5 disappears, when immersed in a trough of liquid. What is the refractive index of the liquid? Give reasons for your answer.

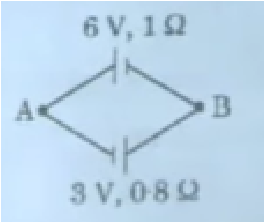
---

19. Two identical circular coils A and B of radius 10 cm each are placed concentrically and mutually perpendicular in XY and YZ planes respectively. Currents of 1 A and $\sqrt{3}$ A flow anticlockwise in the coils as seen from YZ plane. Find the magnitude of the net magnetic field at the common centre of the coils.

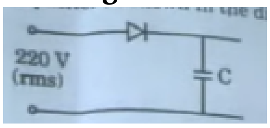
---

20. Draw a plot showing the variation of potential energy of a pair of nucleons as a function of their separation. With the help of the plot, explain why the nuclear force is attractive for $r > r_0$ and repulsive for $r < r_0$.

21. Find the equivalent emf and the equivalent resistance between points A and B for two cells arranged as shown in the figure.

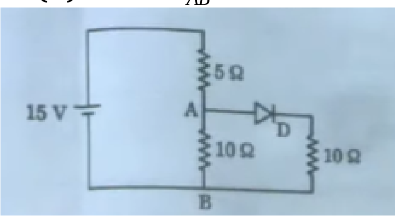


22(a). A diode is connected to 220 V (rms) ac source in series with a capacitor as shown in the diagram.



Find the voltage (rms) across the capacitor.

22(b). Find V_{AB} in the circuit given below.



23(a). Briefly explain the process of charging a parallel plate capacitor, when it is connected across a dc source.

23(b). A capacitor, of capacitance C, plate area A and plate separation d is charged to V volts by a battery. The energy stored in it is U. After some time, the battery is disconnected and a slab of dielectric constant K, is inserted to fill the space between the plates of the capacitor. Let V' and U' now be the potential difference across the plates of the capacitor and the energy stored in it respectively. Find (V'/V) and (U'/U).

24. Derive an expression for refractive index of an equilateral prism in terms of the angle of minimum deviation and the angle of the prism. Plot a graph to show the variation of the angle of deviation as a function of angle of incidence.

---

25. Draw a labelled diagram of a full wave rectifier circuit. State its working principle and show the input-output waveforms.

26(a). Derive the expression for the magnetic field (near its centre) due to an air-filled long solenoid carrying a current I and having n number of turns per unit length.

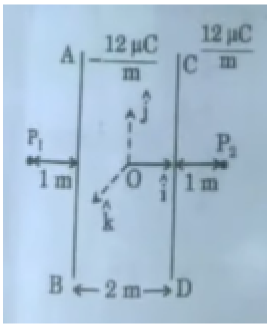
26(b). A charged particle moving with velocity $\vec{v}$ enters a region of uniform magnetic field $\vec{B}$. The force acting on it is non-zero. Would the particle gain any energy? Explain.

27(a). Draw a labelled ray diagram of a refracting telescope in normal adjustment. Briefly explain its working.

27(b). Why is the eyepiece of a telescope of short focal length, while the objective is of large focal length? Explain.

28(a). Two infinitely long thin straight wires AB and CD with charge densities $-12\,\mu$C/m and $+12\,\mu$C/m are lying parallel to y-axis at points $(-1\text{ m}, 0, 0)$ and $(1\text{ m}, 0, 0)$ respectively, as shown in the figure.

Find the net electric field $\vec{E}$ at points $P_1(-2\text{ m}, 0, 0)$, $O(0, 0, 0)$ and $P_2(2\text{ m}, 0, 0)$.



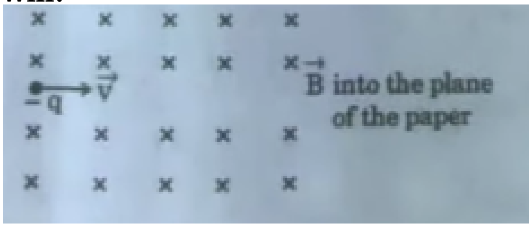
OR

28(b). Two charges of $8\,\mu$C and $-4\,\mu$C are located at points $(-18$ cm$, 0, 0)$ and $(18$ cm$, 0, 0)$ respectively.
(i) Calculate the electrostatic potential energy of the system of the two charges.
(ii) The same system of charges is placed in a region where electrostatic potential $V(r) = \frac{A}{r}$, where $A = 9 \times 10^4$ V.m. Calculate the potential energy of the system.

---

29. A particle of mass m and charge q experiences a force $\vec{F}_e$ in an electric field $\vec{E}$ and it is directed along the field. When the particle is moving with velocity $\vec{v}$ in a magnetic field $\vec{B}$, it experiences a force $\vec{F}_B$, that is perpendicular to both $\vec{v}$ and $\vec{B}$. In presence of both fields, the force acting on the particle is the vector sum of that due to $\vec{E}$ and that due to $\vec{B}$. A current-carrying conductor also experiences a force in presence of a magnetic field. The force $d\vec{F}$ acting on a current-element $Id\vec{l}$ is perpendicular to both the current element, and the magnetic field $\vec{B}$. The net force acting on a conductor of a given length is the vector sum of all $d\vec{F}$s.

29 (i). A negative ion enters a region of uniform magnetic field B as shown in the figure. It will:



(A) go straight, undeviated

(B) describe a circular path

(C) describe a semicircular path

(D) describe a helical path

29(ii)(a). An electron is moving in a circular path in a uniform magnetic field of 3.14×10^{-4} T. Its period of revolution will be approximately :

(A) $0.11\,\mu s$

(B) $0.28\,\mu s$

(C) $0.014\,\mu s$

(D) $0.024\,\mu s$

OR

29(ii)(b). An alpha particle (mass 6.4×10^{-27} kg) moves in a circular path with a speed of 6.28×10^{5} m/s in a uniform magnetic field of 3.14×10^{-3} T. The radius of the path is :

(A) 1.00 m

(B) 2.00 m

(C) 3.00 m

(D) 4.00 m

29(iii). A charged particle enters with a velocity $\vec{v} = (6 \times 10^{6}$ m/s$)\hat{i}$ in a region of magnetic field $\vec{B} = (0.5$ G$)\hat{j}$ and an electric field $\vec{E}$. If the particle goes straight undeviated in the region, then $\vec{E}$ equals :

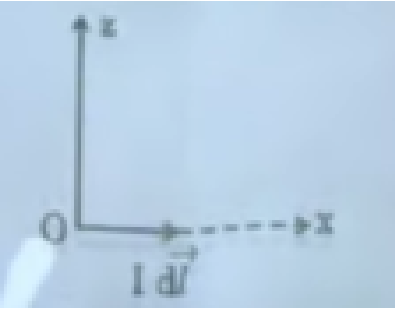
(A) $(120$ N/C$)\hat{k}$

(B) $-(300$ N/C$)\hat{k}$

(C) $(600$ N/C$)\hat{j}$

(D) $-(150$ N/C$)\hat{i}$

29(iv). A current-element ($Id\vec{l}$) of mass per unit length (m) is held in air as shown in the figure. After withdrawing the support, it will remain suspended in its position, when subjected to an external magnetic field $\vec{B}$ equal to :



(A) $\frac{mgdl}{I}\hat{k}$

(B) $\frac{mg}{I}\hat{j}$

(C) $-\frac{mg}{Idl}\hat{i}$

(D) $-(\frac{Idl}{mg})\hat{k}$

---

30. When radiation of suitable frequency is incident on a metal surface, electrons are emitted from the surface. This phenomenon is called photoelectric effect. Einstein explained this phenomenon considering the particle nature of radiation and using the law of conservation of energy. Wave theory of light could not explain this phenomenon.

30(i)(a). A photon of 3.8 eV energy is incident on a surface of work function 1.8 eV. The maximum kinetic energy of the electron emitted from the surface will be :

(A) 3.2×10^{-19} J

(B) 1.6×10^{-19} J

(C) 1.25×10^{-19} J

(D) 2.4×10^{-18} J

OR

30(i)(b). The work function of a photosensitive surface is 2.21 eV. The value of threshold frequency for the surface is :

(A) 4.8×10^{14} Hz
(B) 5.3×10^{14} Hz
(C) 1.9×10^{15} Hz
(D) 1.2×10^{15} Hz

---

30 (ii). The saturation current for a given photosensitive material depends on :

(A) work function of the material
(B) wavelength of the incident radiation
(C) intensity of the incident radiation
(D) collector plate potential

---

30 (iii). The stopping potential of photoelectrons is found to be 0.40 V when light of wavelength 500 nm is incident on a surface. The work function of the surface is close to :

(A) 1.20 eV
(B) 1.48 eV
(C) 2.08 eV
(D) 6.48 eV

---

30 (iv). A graph between the frequency of incident radiation (ν) and the corresponding stopping potential (V_0) for a metal is a straight line. Let α and β be the value of the slope and the value of the intercept on the V_0-axis respectively. Then, according to Einstein's photoelectric equation $(\frac{\beta}{\alpha})$ is :

(A) ν_0

(B) $\frac{1}{\nu_0}$

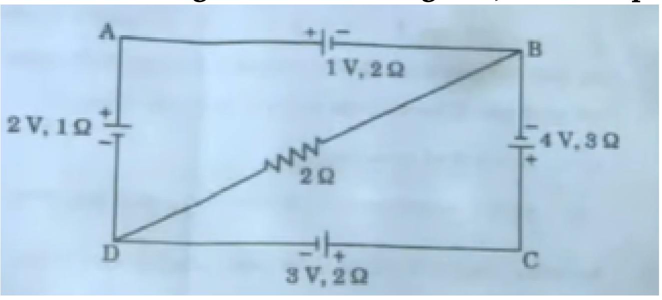
(C) $e\,\nu_0$

(D) $\frac{\nu_0}{h}$

---

31 (a). A potential difference V is applied across the ends of a cylindrical conductor of length l, area of cross-section A and resistance R. It is gradually stretched till its length is tripled. How will (i) the drift speed of electrons in the conductor, and (ii) the resistance of the conductor be affected? Justify your answers.

31(b). In the given circuit diagram, find the potential difference between points B and D.



OR

31 (a). A cell of emf E and internal resistance r is connected across a resistor of variable resistance R. Draw a plot showing the variation of (i) the current (I) in the circuit with R, and (ii) the terminal potential difference of the cell with R.

---

31 (b). The resistance of a heating coil is $100\,\Omega$ at $25°$C and $120\,\Omega$ at $1025°$C.

(i) Find its resistance at $425°$C.

(ii) Draw a plot showing variation of its resistance as a function of increase in temperature.

---

32 (a). Using a phasor diagram, derive an expression for the impedance of a series LCR circuit

connected to an ac source. What is meant by resonance in this circuit? Obtain expression for the resonant frequency of this circuit.

---

32 (b). Write two disadvantages of transmitting ac over long distances at low voltage and high current.

OR

32 (a). An ac generator consists of a coil of 500 turns and size 25 cm $\times$ 100 cm. It is rotated at an angular speed of 60 rad/s in a uniform magnetic field $B = 0 \cdot 4$ T between two fixed pole pieces. If the resistance of the circuit, including that of the coil, is $250\,\Omega$, calculate :

(I) the maximum current drawn from the generator

(II) the flux through the coil when the current is zero

---

32 (b). Give two examples of commercial generators. How is rotation of armature achieved in them? Explain briefly.

---

33 (a). A small bulb is placed at the bottom of a tank containing water to a depth of 1.00 m. Find the area of the surface of water through which light from the bulb can emerge from. The refractive index of water is (4/3).

---

33 (b). An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. On the other side of the lens, a convex mirror is placed coaxially at a distance of 10 cm from the lens. If the image formed by this combination coincides with the object itself, draw the ray diagram and find the focal length of the convex mirror.

OR

33 (a). Differentiate between interference and diffraction of light. Two coherent light waves, each of intensity I_0 produce interference pattern on a screen. Find the intensity at a point at which the path difference between them is (i) $\lambda/3$, and (ii) $\lambda/4$.

---

33 (b). In a Young's double-slit experiment, fringes are obtained on a screen placed at a distance D from the slits. It is observed that if the screen is moved 5 cm towards the slits, the fringe width changes by 0.03 mm. If the distance between the slits is 1 mm, calculate the wavelength of the light used.
